AD-A186 563 THERMOPLASTIC ELASTOMERS AS LOVA BINDERS: END OF THE YEAR REPORT FOR CONTRACT N00014-85-K-0000(U) MASSACHUSETTS UNIV AMHERST J C CHIEN ET AL. 1986 1/1

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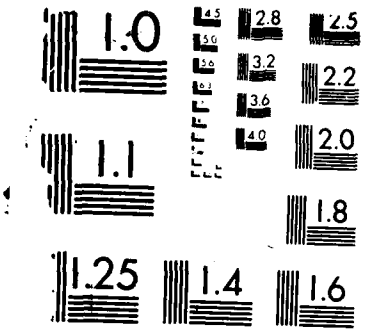

OFFICE OF NAVAL RESEARCH

END-OF-THE-YEAR REPORT

for

Contract N00014-85K-0880

Thermoplastic Elastomers as LOVA Binders

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ONR CONTRACT INFORMATION

Contract Title: Ener. Thermopl

Contract Number: N00014-85-K-0880

Work Unit Number: 5400021SRS

Scientific Officer: Dr. Miller

Enclosure (1)

List of Publications/Reports/Presentations

1. **Papers Published in Refereed Journals:**

"Structure-Property Relationships in Thermoplastic Elastomers: III. Segmented Polyacetal-Polyurethanes", B. Xu, D.N. Khanna, C.P. Lillya and J.C.W. Chien, J. Appl. Polym. Sci., 31, 123 (1986).

"Magnesium Chloride Supported High Mileage Catalyst for Olefin Polymerization. XII. Polymerization of Ethylene", J.C.W. Chien and P. Bres, J. Polym. Sci. Polym. Chem. Ed., 24, 2483-2505 (1986).

"Magnesium Chloride Supported High Mileage Catalyst for Olefin Polymerization. XIII. Effect of External Lewis Base on Ethylene Polymerization", J.C.W. Chien and P. Bres, J. Polym. Sci. Polym. Chem. Ed., 24, 1967-1988 (1986).

2. **Technical Reports:**

#19 "Acidolysis of Poly(4-methyl-1,3-dioxolane)"

#20 "The Modelling of Orientation in Planar Polymer Welding Flows"

#21 "Synthesis and Characterization of Block Copolymers, Part I"

#22 "Synthesis and Characterization of Block Copolymers, Part II."

3. **Presentatior**

NONE

a. **Invited**

b. **Contributed**

James C.W. Chien, Mechanism of Ring Opening Polymerizations of Cyclooxaalkanes, Gordon Research Conference on Polymers, New London, NH, July 3, 1987.

4. **Books (and sections thereof)**

NONE

LIST OF AWARDS

Name of Person Receiving Award	Recipient's Institution	Name of Award	Sponsor of Award
NONE			

Enclosure (3)

PUBLICATIONS/PATENTS/PRESENTATIONS/HONORS REPORT
(Number Only)

Papers Submitted to Refereed Journals (and not yet published): 7

Papers Published in Refereed Journals: 3

Papers Published in Non-Referred Journals: 0

Technical Reports Published: 4

Books (and sections thereof) Submitted for Publication: 0

Books (and sections thereof) Published: 0

Patents Filed: 0

Patents Granted: 0

Invited Presentations at Topical or Scientific/Technical Society Conferences: 0

Contributed Presentations at Topical or Scientific/Technical Society Conferences: 1

Honors/Awards/Prizes: 0

Number of Graduate Students: 7

Number of Post Docs: 5

Principal Investigator: James C.W. Chien Contract # N00014-85-K-0880

Scientific Officer: R.S. Miller

Description of Project:

Alkyl-4(4'-alkoxybenzoyloxy)benzoates, ABB, (with C_1-C_{10} alkyl and alkoxy groups) are monotropic compounds which melt directly to isotropic liquids, twin liquid crystailine compounds, TLCC, have been synthesized from ABB. The TLCC n-butoxy end group and decamethylene or trioxyethylene spacer disp! y smectic/nematic phases. Polymeric TLCC with n-butoxy end groups and $\overline{M}_n$ = 650 poly-THF and $\overline{M}_n$ = 725 poly-PPO spacers are weakly liquid crystalline, whereas TLCC with 425 MW PPO is strongly liquid crystalline. Surprisingly these polymers retained liquid crystalline rheological behavior above the clearing temperature.

Flow induced structure in linear triblock thermoplastic elastomers have been observed. Filled polymer melts exhibit very complicated rheological behavior. Various rheological material functions have been measured for many different filled polymers.

A theory has been formulated based on void formation causing debonding of particulate composites. The predictions show good qualitative and quantitative agreement with the experimental data.

Significant Results During Last Year:

For the first time main chain liquid crystalline polymers have been synthesized. Both polyalkylene oxides and polyfluoroformals (NSWC) have been incorporated as spacers. Mesophase transitions were designed and found to occur at processing temperatures. Structural orders have been shown to exist above clearing temperature by both rheological and spectroscopic measurements. Acid dopolymerizable trioxane-dioxolane hard segments have been synthesized with adjustable melt temperatures from 70°C to 138°C. Synthesis of completely acid depolymerizable LOVA TPE binders have been scaled up by Olin for sampling to China Lake and Aberdeen.

Plan for Next Year's Work:

Energetic TPE will be synthesized and characterized using energetic soft or hard blocks from NSWC, Aerojet General as well as carborane and cubane derivatives.

Attempts will be made to synthesize mesogens from cubanes.

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